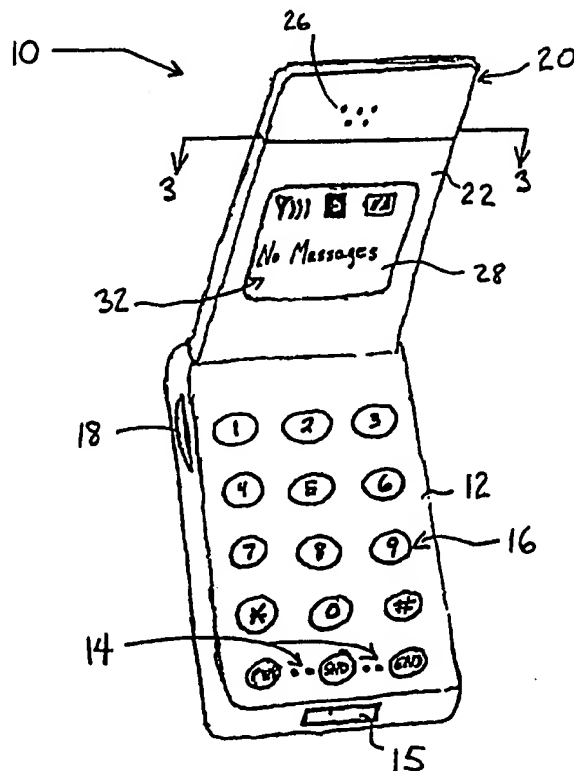




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : H04M 1/02, G06F 1/16	A1	(11) International Publication Number: WO 00/59179 (43) International Publication Date: 5 October 2000 (05.10.00)
(21) International Application Number: PCT/US00/08253 (22) International Filing Date: 29 March 2000 (29.03.00) (30) Priority Data: 09/281,645 31 March 1999 (31.03.99) US (71) Applicant: SONY ELECTRONICS INC. [US/US]; 1 Sony Drive, Park Ridge, NJ 07656 (US). (72) Inventors: BARANOWSKI, Robert; 14370 Bourgeois Way, San Diego, CA 92129 (US). BERG, Roger; 7066 Rockrose Terrace, Carlsbad, CA 92009 (US). (74) Agents: TOTO, Peter, C. et al.; 123 Tice Boulevard, Woodcliff Lake, NJ 07675 (US).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: ELECTRONIC DEVICE HAVING A REVERSIBLE DISPLAY (57) Abstract <p>An electronic device having a main body which includes a main surface having an input device for inputting information. The electronic device further includes a flip that is rotatably attached to the main body. The flip includes a front surface and a rear surface wherein the flip is rotatable between a closed position wherein the front surface is adjacent the main surface and an open position wherein the flip is upstanding relative to the main surface. In addition, the device includes front and rear displays which are located on the front and rear surfaces, respectively, for displaying information.</p>		



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

ELECTRONIC DEVICE HAVING A REVERSIBLE DISPLAY

Field of the Invention

This invention relates to electronic devices which utilize a display, and more particularly,
5 to an electronic device such as a wireless telephone having a two sided and reversible display so
as to enable a user to view a display when a cover, or flip, of the electronic device is closed.

Background of the Invention

It is frequently desirable to reduce the size of a portable electronic device such as a
wireless telephone so as to increase convenience and portability. Many phones of this type
10 include an input device for inputting a telephone number or other data, a display for displaying
data and a cover or flip. The flip may be rotatably attached to a main body of the phone such that
when the phone is not in use, the flip may be rotated to a closed position wherein portions of the
main body are concealed. In a first type of phone design, the display and input device are located
in upper and lower portions, respectively, of the main body. Further, the flip is sized such that
15 the input device, and not the display, is concealed when the flip is closed. In a second type of
phone design, the display is located in the flip whereas the input device is located in the main
body. In this configuration, the flip is folded over onto the input device when the flip is closed
thus concealing the display and forming a clamshell design which is smaller in size than the first
phone design.

20 Frequently, a liquid crystal display (LCD) or similar device is used to display information
on a wireless telephone. Such displays include a liquid crystal material which is positioned
between front and rear glass plates to form an LCD cell. A surface treatment is applied to an
inner surface of each glass plate such that molecules in the liquid crystal material near each inner
surface align in the direction of the surface treatment. In LCDs known as twisted nematic LCDs,
25 the inner surfaces are positioned orthogonal to each other such that a 90 degree twist is formed in
the liquid crystal material.

A front and rear polarizer is formed on an outer surface of the front and rear glass plates, respectively. Light which is incident on the front polarizer becomes linearly polarized and subsequently passes through the first glass plate. The light is then rotated 90 degrees by the liquid crystal material and passes through the second glass plate and rear polarizer. In a
5 reflective display, the rear polarizer further includes a diffuse reflector which may be fabricated from brushed aluminum. The reflector serves to reflect the light back through the rear polarizer and LCD cell to ultimately emerge from the front polarizer as a silver-gray color.

Further, an electric field may be applied to the LCD cell which causes the liquid crystal molecules to rotate in the direction of the electric field. As a result, the incoming light is
10 absorbed by the rear polarizer. When this occurs, an observer sees, for example, a black character on a silver-gray background. In order to improve visibility, a backlighting device which includes a light source such as a cold cathode fluorescent tube (CCFT) or a hot cathode fluorescent tube (HCFT) may be used.

However, a user is not able to view the LCD when the flip is closed in a clamshell style
15 phone. As such, information on the LCD cannot be viewed when the phone is in its most space efficient configuration.

Summary of the Invention

This invention relates to an electronic device having a main body which includes a main surface, having an input device for inputting data. The electronic device further includes a flip
20 that is rotatably attached to the main body. The flip includes a front surface and a rear surface wherein the flip is rotatable between a closed position wherein the front surface is adjacent the main surface and an open position wherein the flip is upstanding relative to the main surface. In addition, the device includes front and rear displays which are located on the front and rear surfaces, respectively, for displaying information.

Brief Description of the Figures

FIGURE 1 is a view of a wireless telephone having a flip located in an open position in
accordance with the present invention.

FIGURE 2 is a view of the wireless telephone wherein the flip is in a closed position.

FIGURE 3 is a cross sectional view of the wireless telephone along section line 3-3 of FIGURE 1.

FIGURE 4 is a cross sectional view of the wireless telephone along section line 4-4 of
5 FIGURE 2.

Detailed Description of the Invention

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail specific embodiments, with the understanding that the present disclosure is to be considered as an example of the principles of
10 the invention and not intended to limit the invention to the specific embodiments shown and described. In the description below, like reference numerals are used to describe the same, similar or corresponding parts in the several views of the drawing.

Referring to FIGURE 1, in conjunction with FIGURE 2, a wireless telephone 10 such as cellular or cordless phone having a reversible display in accordance with the present invention is
15 shown. Although the present invention is described in relation to phones, it is noted that the present invention may also be utilized in conjunction with other electronic devices such as personal digital assistants (PDAs), cameras, pagers, personal computers, radios, recording and/or playback devices, calculators, televisions and others.

The phone 10 includes a main body 12 having a microphone 14, an input device 16 such
20 as a touch sensitive device, touch screen, pointing device, mouse pointer, keypad and the like for inputting phone numbers or other data. In addition, the main body 12 may include a selection mechanism 18 for selecting stored information such as phone numbers, an antenna 11, accessory connector 15, battery, circuit boards and other components typically used for providing phone functionality. The phone 10 further includes a cover or flip 20 having a front surface 22 and a
25 rear surface 24. The front surface 22 includes a speaker 26 and a front display 28 which serves to

display information associated with operation of the phone 10 such as whether or not a message has been received, battery strength, signal strength and others. The flip 20 is rotatably attached to the main body 12, thus enabling rotation of the flip 20 between an open position and a closed position relative to the main body 12. Referring to FIGURE 1, the flip 20 is shown in the open position. In this position, the flip 20 is located in a substantially upstanding orientation relative to the main body 12, thus enabling a user to view the front display 28 and also providing access to the input device 16.

Referring to FIGURE 2, the flip 20 is shown in the closed position. The flip 20 may be moved to the closed position by rotating the flip 20 downward toward the main body 12 until the flip 20 is oriented substantially parallel to the main body 12 and the front surface 22 is adjacent the main body 12, thus reducing the overall size of the phone 10. In this position, the input device 16 and the front display 28 are concealed by the flip 20. In accordance with the present invention, the rear surface 24 of the flip 20 includes a rear display 30 which serves to display information, when the flip 20 is in the closed position, similar to that displayed on the front display 28. In one embodiment, software may be used to invert an image 32 displayed on the front display 28 and to generate an inverted image 34 which is then displayed on the rear display 30. This enables the user to view information associated with operation of the phone 10, such as whether or not a message has been received, battery strength, signal strength and others, even when the front display 28 is concealed.

Referring to FIGURE 3, a cross sectional view along section line 3-3 of FIGURE 1 is shown. The flip 20 further includes a liquid crystal display (LCD) 36 having the front 28 and rear 30 displays. The front 28 and rear 30 displays are located adjacent front 38 and rear 40 optical guides, respectively. The flip 20 further includes front 42 and rear 44 light sources which are located adjacent light gathering ends 46 of the front 38 and rear 40 optical guides, respectively. In one embodiment, the front 42 and rear 44 light sources may include a cold cathode fluorescent tube (CCFT), hot cathode fluorescent tube (HCFT), a light emitting diode (LED), or other similar lighting device. The front 28 and rear 30 displays are located adjacent front 48 and rear 50 apertures formed in the front 22 and rear 24 surfaces which enable the user to view the front 28 and rear 30 displays, respectively. When the flip 20 is in the open position,

circuitry associated with the phone 10 causes the rear light source 44 to be turned on and the front light source 42 to be turned off. Light 52 generated by the rear light source 42 is captured by the light gathering end 46 of the rear optical guide 40. The rear optical guide 40 then directs the light 52 toward the rear display 30. This serves to backlight the front display 28, thus
5 improving visibility of the front display 28. In addition, it is noted that the LCD 36 may be a transfective LCD.

Referring to FIGURE 4, a cross sectional view along section line 4-4 of FIGURE 2 is shown. As previously described, the front surface 22 is adjacent the main body 12 when the flip 20 is moved to the closed position, thus concealing the front display 28. In addition, as also
10 previously described, the inverted image 34 is displayed on the rear display 30 when the flip 20 is moved to the closed position. When this occurs, circuitry associated with the phone 10 causes the front light source 42 to be turned on and rear light source 44 to be turned off. Light 54 generated by the front light source 42 is then captured by the light gathering end 46 of the front optical guide 38 and directed toward the front display 28. As such, the direction of the
15 illumination used for backlighting is reversed relative to that which occurs when the flip 20 is in the open position. This serves to backlight the rear display 30, thus improving visibility of the rear display 30 when the flip 20 is in the closed position.

Referring back to FIGURE 3, the flip 20 may further include a movable light inhibiting element 56, such as a door, which is positioned so as to cover and uncover the rear aperture 50 when the flip 20 is in the open and closed positions, respectively. In FIGURE 3, the element 56
20 is shown covering the rear aperture 50. In this position, the element 56 shields the rear display 30 from outside light 58, thus further improving visibility of the front display 28 when the flip 20 is in the open position. Referring to FIGURE 4, the element 56 may then be moved away from the rear aperture 50 to enable viewing of rear display 30 when the flip 20 is in the closed
25 position.

Alternatively, the light blocking element 56 may be a passive or active light filter that is stationary. In this configuration, the light filter is adapted to absorb or redirect light incident on the rear display 30 so as to improve visibility of the front display 28 when the flip 20 is in the open position. The light filter may also be adapted to let light through to allow viewing of the

rear display 30 when the flip 20 is in the closed position.

Thus it is apparent that in accordance with the present invention, an apparatus that fully satisfies the objectives, aims and advantages is set forth above. While the invention has been described in conjunction with specific embodiments, it is evident that many alternatives, 5 modifications, permutations and variations will become apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended that the present invention embrace all such alternatives, modifications and variations as fall within the scope of the appended claims.

What Is Claimed Is:

1. An electronic device, comprising:
a main body having a main surface which includes an input device for inputting data;
a flip rotatably attached to said main body, said flip having a front surface and a rear surface wherein said flip is rotatable between a closed position wherein said front surface is adjacent said main surface and an open position wherein said flip is upstanding relative to said main surface; and
front and rear displays located on said front and rear surfaces, respectively, for displaying information.
2. The device according to claim 1, wherein said front display displays information which is substantially similar to that displayed on said rear display.
3. The device according to claim 1, wherein said information is related to operation of said electronic device.
4. The device according to claim 1, wherein said front and rear displays are backlit.
5. A portable electronic device, comprising:
a main body having a main surface which includes an input device for inputting data;
a flip rotatably attached to said main body, said flip having a front surface and a rear surface, wherein said flip is rotatable between a closed position wherein said front surface is adjacent said main surface and an open position wherein said flip is upstanding relative to said main surface;
a front display located on said front surface for displaying information when said flip is in said open position, wherein said front display is concealed when said flip is in said closed position; and

8

a rear display located on said rear surface for displaying information when said flip is in said closed position.

6. The device according to claim 5, wherein said front display displays information which is substantially similar to that displayed on said rear display.

7. The device according to claim 5, wherein said information is related to operation of said electronic device.

8. The device according to claim 5, further including a liquid crystal display which includes said front and rear displays.

9. The device according to claim 5, wherein said front display is backlit when said flip is in said open position.

10. The device according to claim 5, wherein said rear display is backlit when said flip is in said closed position.

11. The device according to claim 5 wherein said flip further includes a light filter for improving visibility of the front display.

12. A portable communication device, comprising:
a main body having a main surface which includes an input device for inputting data;

a flip rotatably attached to said main body, said flip having a front surface and a rear surface, wherein said flip is rotatable between a closed position wherein said front surface is adjacent said main surface and an open position wherein said flip is upstanding relative to said main surface;

a front display located on said front surface for displaying information when said

flip is in said open position, wherein said front display is concealed when said flip is in said closed position;

a rear display located on said rear surface for displaying information when said flip is in said closed position;

a front backlight device for backlighting said rear display when said flip is in said closed position;

a rear backlight device for backlighting said front display when said flip is in said open position; and

a door located in said flip, said door being movable between a closed position wherein said door covers said rear display when said flip is in said open position and an open position wherein said door does not cover said rear display when said flip is in said closed position.

13. The device according to claim 12, wherein said front and rear backlight devices include a cold cathode fluorescent tube or a hot cathode fluorescent tube.

14. The device according to claim 12, wherein said front and rear backlight devices include a light emitting diode (LED).

15. The device according to claim 12, wherein said front and rear backlight devices are located adjacent rear and front optical guides, respectively.

16. The device according to claim 12, further including a liquid crystal display (LCD) which includes said front and rear displays.

17. The device according to claim 16, wherein said LCD is positioned between said front and rear optical guides.

18. The device according to claim 12 wherein said device is a wireless telephone.
19. The device according to claim 12 wherein information displayed on said front display is substantially similar to that displayed on said rear display.
20. The device according to claim 12 wherein said information is related to operation of said device.
21. The device according to claim 12 wherein an image displayed on said first display is inverted to form an inverted image which is then displayed on said rear display.

1/2

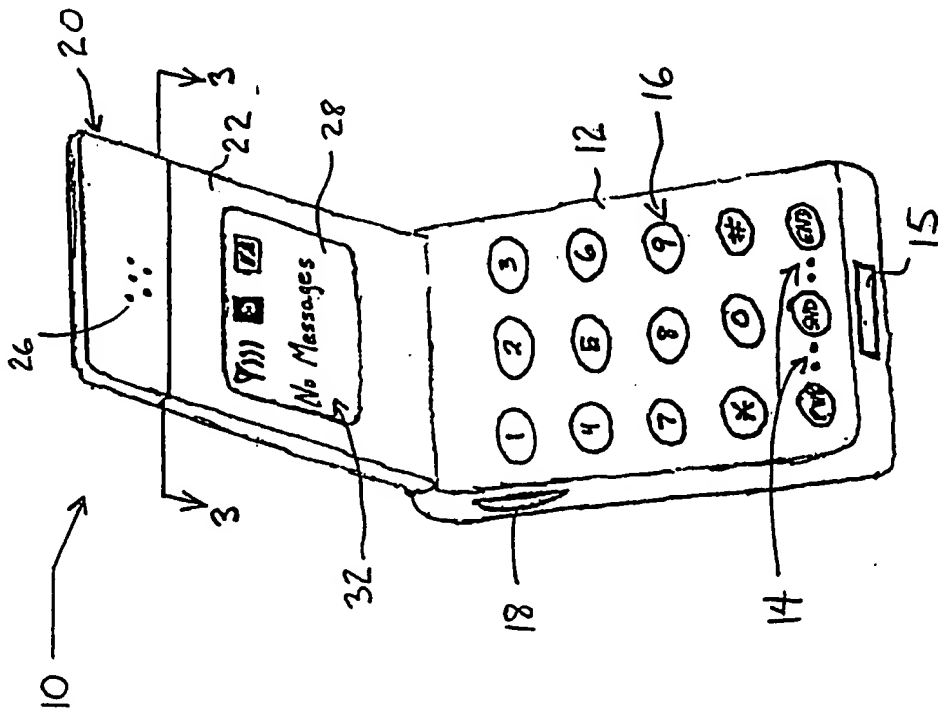


FIG 1

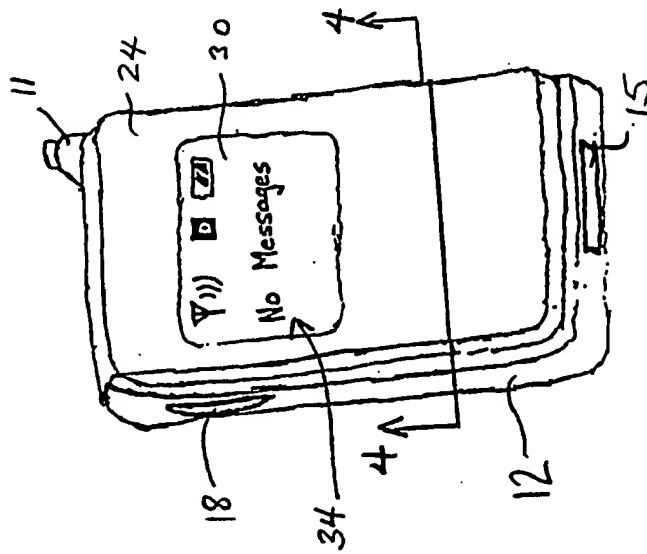
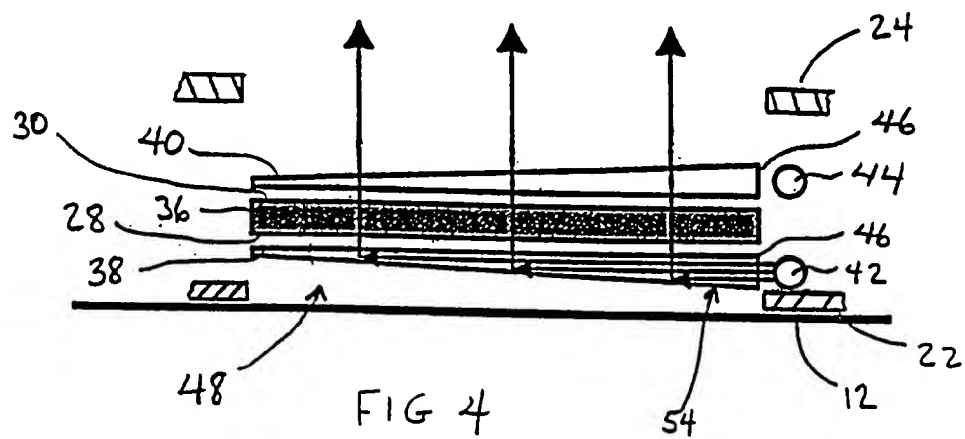
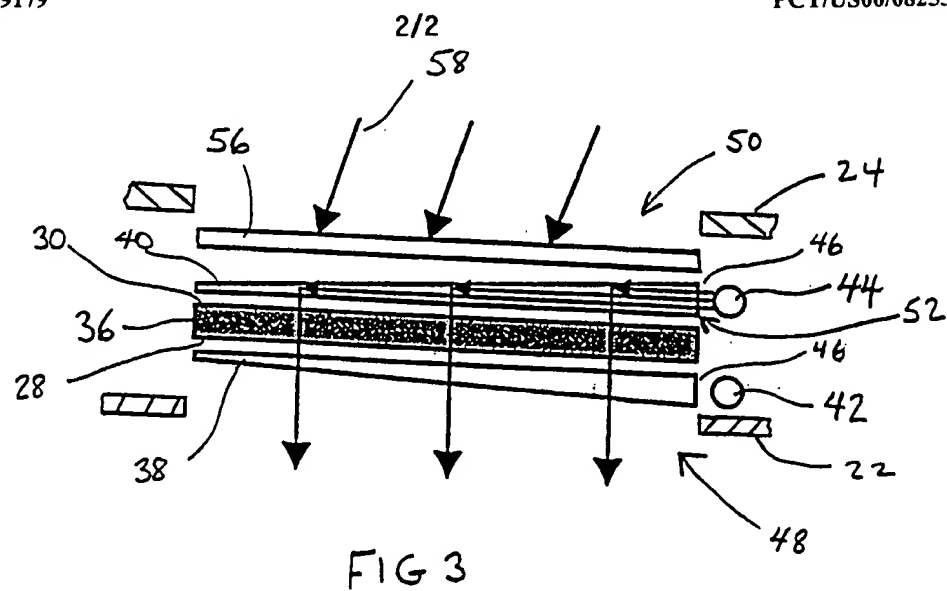


FIG 2



INTERNATIONAL SEARCH REPORT

Int'l. Application No

PCT/US 00/08253

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04M1/02 G06F1/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 38822 A (MOTOROLA INC) 3 September 1998 (1998-09-03) column 2, line 15 -column 3, line 30; figures 1-3	1-3, 5-8
A	---	12
X	US 5 796 577 A (OUCHI GENJIRO ET AL) 18 August 1998 (1998-08-18) column 1, line 55 -column 2, line 42; figure 1	1-3, 5-7
X	DE 40 19 755 A (TRIUMPH ADLER AG) 9 January 1992 (1992-01-09) abstract; figure 1	1-4
A	---	5-10, 12
	--- -/-	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

A document member of the same patent family

Date of the actual completion of the international search

11 July 2000

Date of mailing of the international search report

19/07/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

de Biolley, L

INTERNATIONAL SEARCH REPORT

Int. J. Application No

PCT/US 00/08253

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	GB 2 343 324 A (SAMSUNG ELECTRONICS CO LTD) 3 May 2000 (2000-05-03) page 2-4; figures 1-4	1-3,5-8
A	-----	12

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. Jonal Application No

PCT/US 00/08253

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9838822 A	03-09-1998	US 5896575 A BR 9714549 A CN 1247675 A EP 0963668 A	20-04-1999 08-02-2000 15-03-2000 15-12-1999
US 5796577 A	18-08-1998	JP 10207574 A	07-08-1998
DE 4019755 A	09-01-1992	NONE	
GB 2343324 A	03-05-2000	DE 19952682 A	11-05-2000